NISTIR 6890

Fire Resistance Determination and Performance Prediction Research Needs Workshop: Proceedings

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U.S. Department of Commerce
Donald L. Evans, Secretary

Technology Administration
Phillip J. Bond, Under Secretary of Commerce for Technology

National Institute of Standards and Technology
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J. Degradation in Performance of Installed Fire Resistance Materials
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Performance of Installed Fire Resistance Materials

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Process

- Erect structure
- Apply fireproofing
- Inspect fireproofing (maybe)
- Scrape off fireproofing
- Install other building services
- Cover everything up with finishes
- Forget about it

Some issues

- Connections
- Attachments
- Long spans
- End restraint
- Condition of fireproofing
- W/D ratios

Connections

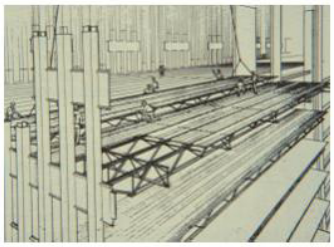
- Connections not evaluated in tests
- How should they be protected?

Attachments

- How much fireproofing do attachments require? Thickness? Length?

Long spans

- Spans of approximately 12-15 feet tested
- Actual spans can be much longer



End restraint

- Test specimens wedged into frame
- How does this relate to real-world restraint?

Condition of fireproofing

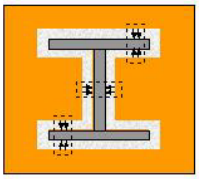
- How can deficiencies in fireproofing be recognized? How can they be analyzed?

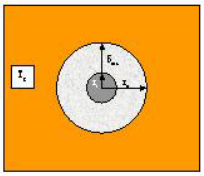
Missing fireproofing

- What is the effect on overall performance?
- What tools are needed / available to analyze?

W/D ratios

- W/D ratios used for different geometries
- Theory based on Cartesian 1-D analysis
- Not applicable to cylindrical coordinates





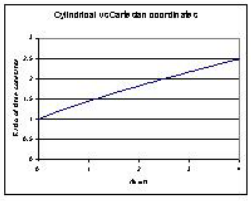
Time constants ~ W/D ratios

- Cartesian

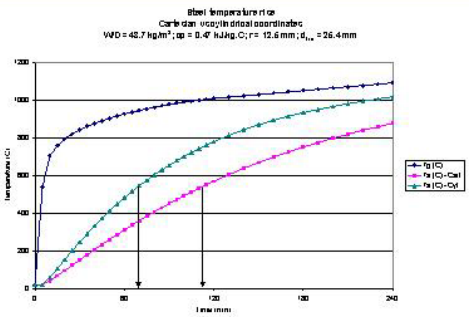
$$\tau = \frac{\rho_s c_{ps} \delta_{ins} \delta_s}{2k_{ins}}$$

- Cylindrical

$$\tau = \frac{\rho_s c_{ps} r_i^2 \ln(r_o / r_i)}{2k_{ins}}$$



Example



Summary

- There are a number of significant issues related to predicting field performance of structural fire protection
- Some issues are widely recognized
  - Missing fireproofing / attachments / restraint
- Some issues not as widely recognized
  - Connections / spans / W/D ratios
- All issues require research to improve predictive capabilities